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### Saturated soils and supplemental nitrogen: Research update.

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Excessive wet weather can cause substantial N loss and damage corn plants. With plentiful and persistent rainfall in 2015 we were able to examine crop response to supplemental and late-applied N at three locations.

**Location 1:** Corn was planted May 23 in a 30-acre field with silt loam soils near Romney, IN. Starter fertilizer was 21 lb N/ac in 2x2 placement.

Rainfall in May was 5.6 inches with 3 inches after planting. June and July rainfall totaled almost 15 inches.

Soil nitrate-N in mid-July was extremely low, only 2 and 4 parts per million in the 0-1 and 1-2 foot soil depths. Nitrogen deficiency symptoms associated with differences in N loss related to soil properties was easily seen prior to fertilization (picture on right).

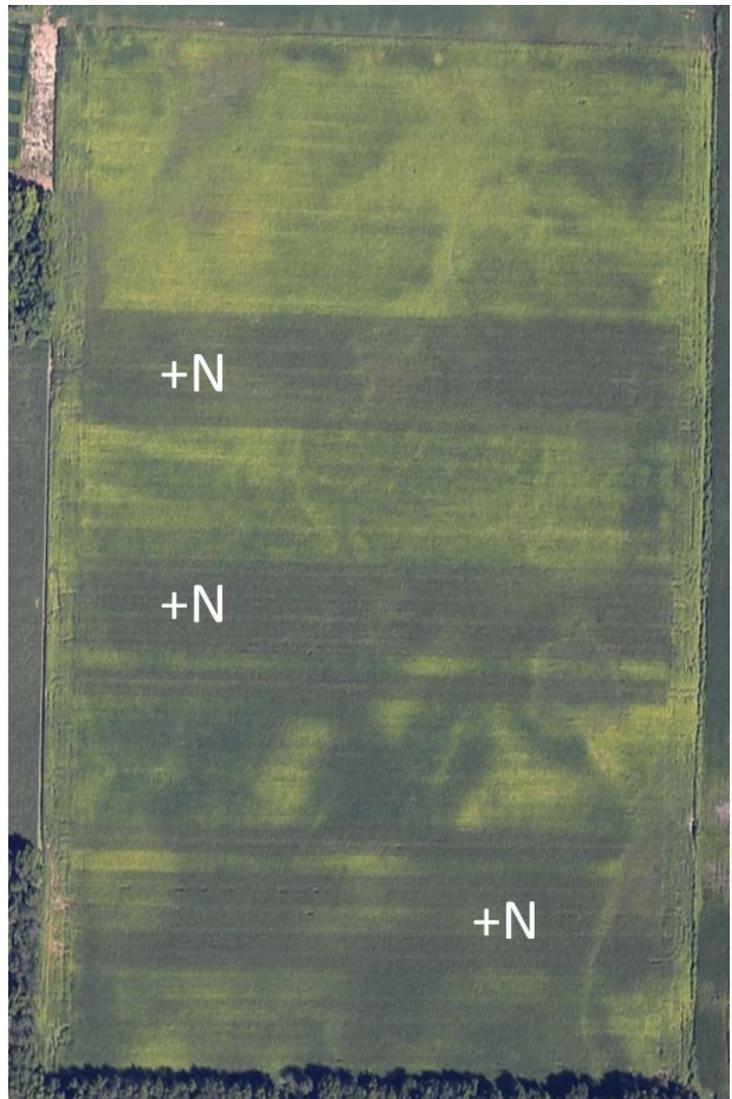
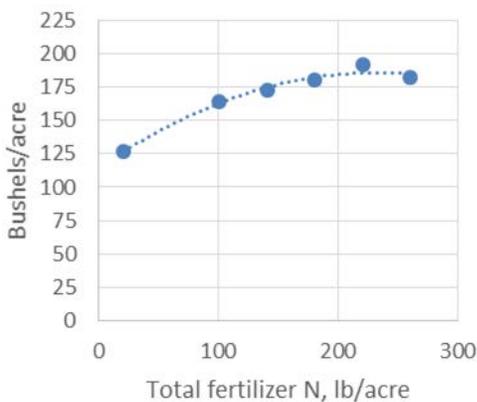
Liquid nitrogen (28-0-0 UAN) was applied on August 5 to 12-row plots about 1,200 feet long with drops on a high-clearance applicator at rates of 0, 80, 120, 160, 200, and 240 lb N/ac. Each treatment was repeated 6 times in the field.



7 Aug.; Romney, IN (image **airSCOUT**)

Rainfall after the late N application was only 0.7 inches in the first 2 weeks after application yet a strong response to applied N can be seen in the aerial photo (picture on right). Only 2.5 inches of rainfall occurred in the next 5 weeks.

Despite tremendous rainfall early that resulted in delayed fertilization, less than ideal plant health, and dry weather after N application the crop responded strongly to the N applied near tasseling time. After harvest the economic optimum N rate was about 175 lb N/ac and yield achieved was over 180 bu/ac (graph below). Left unfertilized grain yield was about 125 bu/ac.



20 Aug.; Romney, IN (image **airSCOUT**)



Crop appearance, LaCrosse, IN; 23 June

**Location 2:** Corn was planted April 30 on sandy soils near LaCrosse, IN. Rainfall was 9.3 inches in May. Liquid N (28-0-0 UAN) was applied at 180 lb N/acre at the end of May, followed by nearly 11 inches of rain in June.

Supplemental N was applied July 1 at 0, 75, and 125 lb N/ac with a regular liquid N applicator. About one week earlier, the corn was yellow-green and stunted with significant death of the lower leaves (picture to left), but the root system appeared relatively healthy. Not all the N was lost from the soil, however. Nitrate-N was 20 ppm in the upper foot of soil and 9 ppm in the 2<sup>nd</sup> foot. Grain yield averaged about 100 bu/ac and there was no benefit to supplemental N.

**Location 3:** Corn was planted May 7 near Morristown, IN on poorly drained soils with 31 lb N/acre applied preplant. Split N applications were V4, V14, and R1 (silking) (see table below for rates). Rainfall was about 11 inches between the V4 and V14 applications. Another 5 inches fell between V14 and R1. Despite the waterlogged conditions and likely N loss from the V4 application there were no differences in yield among timing treatments, which averaged 206 bu/ac. Only 1.2 inches of rain fell in August and 1.8 inches in September. Dry soils may have limited the response to the later applied N.



Saturated soils, Morristown, IN; 27 May

**Growth stage at time of sidedress application**

<b>V4</b>	<b>V14</b>	<b>R1</b>	<b>Grain yield</b>
<b>Sidedress N, lb N/ac</b>			<b>Bu/ac</b>
200			204
100	100		208
100	50	50	204
50	150		208
50	75	75	206

*See next page for summary....*

## Summary

Previous research found corn has a tremendous capacity to respond to late-season N provided the plant is N deficient, but otherwise healthy.<sup>1</sup> When N loss occurs because of excessively wet conditions, lower yield potential due to the water-logged damaged root system complicates the decision to apply additional N fertilizer.

Results differed substantially among the three experiments we conducted in areas of excessive rainfall, apparent N loss, and likely impacts on crop health.

In one case a 50 bu/ac increase in yield occurred with 175 lb N/ac applied about tassel time to highly N deficient plants on soils depleted of nitrate-N.

In the 2<sup>nd</sup> situation the root system of the crop appeared relatively healthy, but yield of 100 bu/ac suggested this assessment was too optimistic, and supplemental N did not increase yield.

In the third case an evaluation of split N timing was intended from the beginning of the season. Although V14 and R1 (silking) applications were made after 11 and 16 inches of rain had fallen after the V4 application there was no difference in yield among N timing treatments.

Response to supplemental N after excessive rainfall can be quite variable. Measuring response by leaving several untreated strips or applying more than one supplemental rate of N will not only allow one to assess the profitability this year's response, but enable better assessments in future year's on potential response to supplemental N.

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<sup>1</sup>Late-season nitrogen application for corn.

<https://www.agry.purdue.edu/ext/soilfertility/news/Late-seasonnitrogen.pdf>

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